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Didactic ideational knowledge that student teachers learn in a single supervisory conference

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Abstract

Preservice teachers are supposed to learn didactical ideational knowledge in their supervisory conferences. This study identified sources of such ideas and assessed the learning of 8 dimensions of knowledge. We found that the sources of substantial portions of the learned new ideas were not the supervisory conference, and most students' didactical ideational knowledge expanded as well as the self creation of substantial aspects of these ideas, namely, complexity, abstractness, and generality. Implications for supervisory conferences were drawn from these findings.

Keywords: Pre-service education, supervision, ideational knowledge mapping, learning;

1. Introduction

Professional training, including teacher education combines theoretical studies with field experience or practicum. During their studies the prospective teachers acquire the theoretical principles of teaching and the skills of teaching in real life classrooms. The two kinds of knowledge are known as propositional (or conceptual) and procedural, respectively (e.g., Anderson, 1995). We will replace the term “propositional” by “ideational” to better reflect the nature of that knowledge, which consists of the ideas that an individual has about the teaching, students, school and educational system as well as her or his future profession. Field experience of all kinds consists mainly in the prospective teachers teaching at elementary schools, high schools and nursery schools where they are tutored by a mentor teacher and also guided and overseen by a teacher education supervisor. The major goals of field experience is that student teachers acquire and integrate the two kinds of knowledge, and get acquainted with real life classroom teaching.

The common field experience consists of a series (varying in number) of triplets of a pre-teaching conference, teaching a lesson, and a supervisory post-teaching conference with the mentor teacher supervisor. The post teaching conference usually provides feedback from the classroom observation with reference to other related pedagogical or didactic issues (e.g., Zeichner & Liston, 1987). Teacher education programs often include a subsequent complementary independent school teaching. The expectation is that student teachers learn the ideas expressed in

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the pre- and post-teaching conferences and develop and expand their professional knowledge base, and it is consensual that this kind of field experience is the best means to fulfill these expectations.

Israeli teacher education programs devote substantial portions of coursework to didactical principles and their application in order that prospective teachers acquire much and varied didactical ideational knowledge. Yet research on teacher education or field experience does neither identify the sources of ideational knowledge and which parts of it were acquired in each of them nor inform on the occurrence of learning such knowledge.

To identify the ideational knowledge that students acquire we first define learning processes of ideational knowledge as "the (conscious or unconscious) execution of procedures that aim at or end up with the storage of information (that was presented to the individual from without or has been created during the processing) in the individual's long term ideational memory" (Hoz, 2009). The individual's ideational knowledge can be exposed by its externalization in ways like verbal, visual (graphic or pictorial), and dynamic expressions, which are modified by the acquisition of new ideas. This has traditionally been done interpretatively by the analysis and of linear textual (written or oral) data which manage to capture some authentic ideas of the interviewees. Yet they can neither display the 'true' nature of ideational knowledge, which includes, among other features, the interconnections among these desolate ideas, nor do they inform on less easily conceivable features, such as the centrality of concepts, and the extension-scope, depth, complexity, coherence, the organization and structure of that knowledge). In this study we used the probe of Ideational Knowledge Mapping (Hoz et al., 1997), which is described succinctly in the sequel (an elaborate account is found in Hoz, [2009]).

If the source of the ideational didactical knowledge cannot be identified during numerous interfering activities over long time periods we surmised that this identification may be possible if we restrict the study to a single supervisory conference and a short period of time between the measurements. Therefore our research question was: Do student teachers acquire didactical ideational knowledge in a single supervisory post teaching conference? And if so – what are its source and nature?

2. Methodology

The participants were 7 pairs of student teachers and their supervisors in two teachers' colleges. Student's didactic knowledge was tapped twice by Ideational Knowledge Mapping: before they taught a lesson and after the supervisory conference that followed the lesson and was audio taped. Seven dimensions of didactic knowledge were compared between the data from each student's pre- and post-lesson maps, with regard to the supervisor's ideas.

The population that was studied is Israeli early education prospective teachers and the sample consisted of 7 prospective teachers in two Israeli teachers' colleges. The unit of analysis is the pair of a volunteer student teacher and her supervisor. Two supervisors had two student teachers each.

A before-after research design was used to measure changes in the student teachers' didactical ideational knowledge following a single supervisory conference. Two kinds of probes were used to tap data: Ideational Knowledge Mapping tapped the didactical ideational knowledge and audio taping was used to tap the ideas expressed by the pair members, and free observations and field notes were used to record other visual and emotional communications.

The Ideational Knowledge Mapping is an elaborate, versatile and flexible alternative to the traditional concept mapping, as it includes additional graphic elements which enable individuals to better express their ideas . That map (Figure 1) is produced from a given set of concepts solely by the interviewee and is recorded by the interviewer and it includes 5 graphic components: Concepts (in capitals), concept clusters, lines connecting pairs of components

(concepts or clusters), black circles (nodes) that link 3 or more components, and texts on the cluster circumference, at the nodes and outside the map (the rationale).

All Ideational Knowledge Maps were constructed with the same set of 14 concepts on which we have decided by help of 30 teachers' college faculty. Their analysis yielded 8 dimensions of didactical ideational knowledge: the important concepts, the nature and meanings of the important concepts, and the ideational knowledge richness, depth, abstractness, complexity, and integration.

The procedures were as follows: Before teaching the class each student teacher filled in a personal questionnaire and constructed the pre-teaching Ideational Knowledge Map, then she taught the class being observed by the supervisor and one of the researchers all of whom convened for the post-teaching conference that was observed and audio taped by one of the researchers. Within 2 weeks from that meeting the student teacher constructed the post-teaching Ideational Knowledge Map. The presented group values were derived from the combination of the values of the individual participants' dimensions.

The Ideational Knowledge Maps were analyzed to yield the values of each dimension, and the ideas that were expressed in the conference were sorted as general, didactical, and pertinent to the class that were taught.

The learning of didactic ideational knowledge was measured by 8 dimensions, of which two have sub-dimensions. Some dimensions characterize individual map's components (concepts, links, and clusters) while others are representative (typical) of the components. The gained didactical Ideational Knowledge was identified by the comparison of the values of its dimensions in the pre-and post-class' maps.

The Ideational richness is the wealth of ideas, both direct and indirect, and is reflected in 6 sub-dimensions: The mean numbers of ideas (of all lengths) per concept, of links among more than two concepts, of concepts linked by a link, and the proportion of mean number of didactic ideas (of all lengths) linked by a link, the range of numbers of concepts linked by the links, and the number of clusters with titles.

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The complexity is the mean number of basic ideas (propositions) that comprise an idea. The abstractness of ideas is the number of cluster titles, and the existence of the map's rationale. The generality of ideas is the idea's distance from the features of the taught class. The importance of concepts is the number of links of the important concepts (teacher and school student) with the other concepts. The meaning of important concepts is the number of aspects in the meaning of the important concepts (teacher and school student). The depth of knowledge is the number of map's clusters and sub-clusters. The integration of concept clusters is the proportion of their internal links out of all map's links.

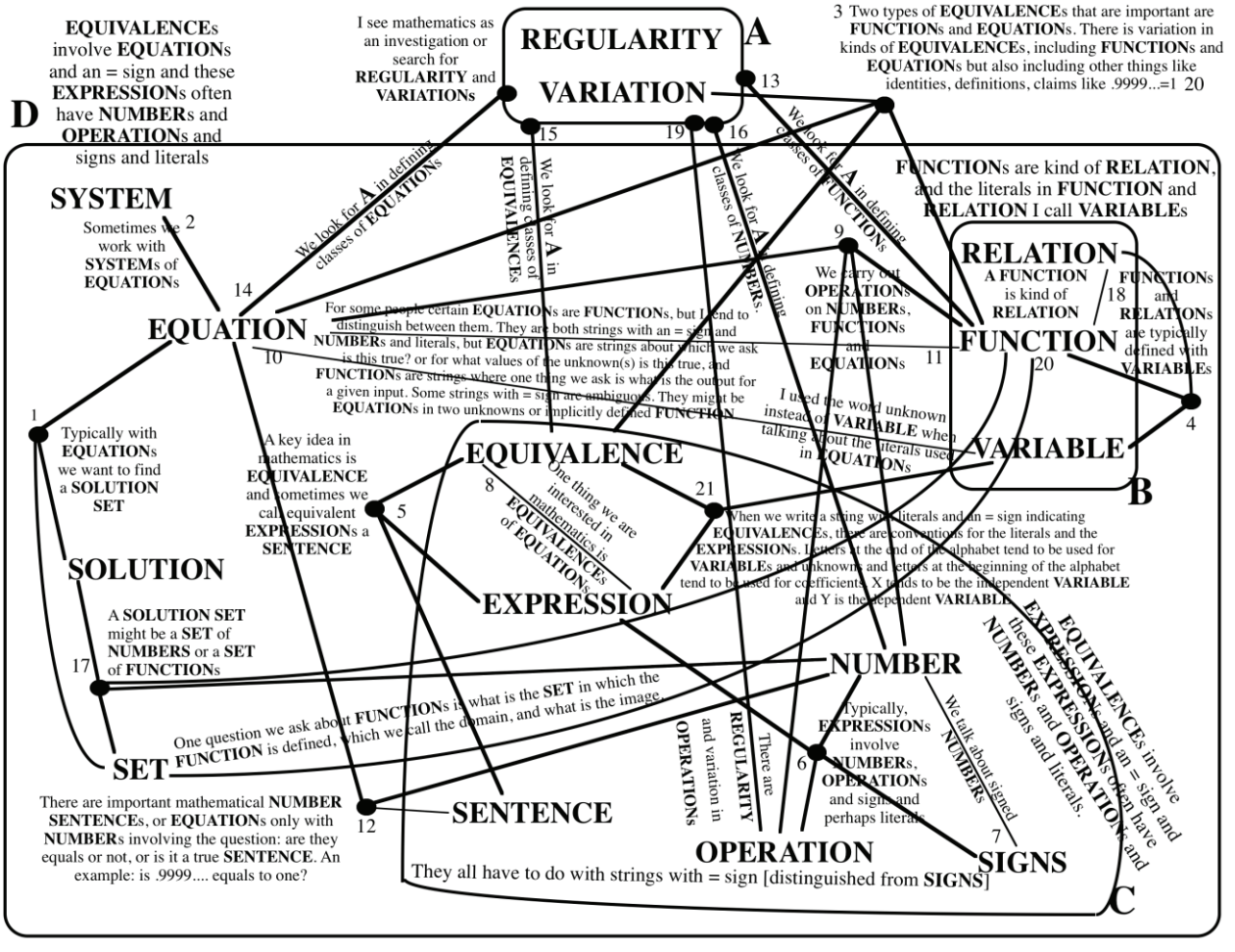
3. Findings

The findings pertain to the sources of new didactic ideas and the degrees of their acquisition.

Table 1 depicts the sources of new didactic ideas in the post-class map. These figures show that the majority (50-90%) of the didactical ideas were not new, as they were expressed in the pre-class map or in the conference, and of the new ideas, about one third were not expressed by the student teacher before the class or in the conference and the source of their minority (up to 10%) was the conference.

The results are that most students learned 3 sub-dimensions of the ideational richness in high and moderate degrees and did not learn in 2 sub-dimensions, increased the complexity of their knowledge to moderate and low degrees, increased the abstractness of their knowledge to all degrees, learned on the important concepts in moderate and low degrees, learned on the important concepts in moderate and low degrees, increased the depth of their knowledge in high and moderate degrees, and all students did not change the integration of their knowledge.

The degrees of individual students' acquisition of the different dimensions were measured on 3 level dimension-specific scales of High, Moderate and Low, and the students' distributions are depicted in Table 2.



I notice **EQUATION**s and **FUNCTION**s as key kinds of **EQUIVALENCE**s. Certain words for me are linked to **EQUATION** and **FUNCTION**. **EXPRESSION** was more general and included **NUMBER**s, **OPERATION**s and signs as involved in almost all kinds of **EQUIVALENCE**s. I put **SENTENCE** next to **NUMBER** because **NUMBER**s **SENTENCE**s are the most common **SENTENCE**s. **REGULARITY** an variation together above everything else because to me they are central ideas in mathematics and they relate to all of these kinds of **EQUIVALENCE**s and all of these, as well as many ideas that are not seen here.

Figure 1. Sample Ideational Knowledge Map of a mathematics teacher.

Table 1. Source and number and proportion of acquired new didactic ideas in the post-class map

Student	Number of didactic ideas in post-class map	New (post-class map's) ideas**			
		Previous (pre-class map's) ideas			
		Before the class	Before the class and in conference	Expressed by student only in the conference	Never expressed by the student
1	23	4 (17%)	8 (34%)	2 (8%)	9 (39%)
2	24	12 (50%)	4 (17%)	1 (5%)	7 (30%)
3	18	6 (33%)	5 (28%)	1 (6%)	6 (33%)
4	10	3 (30%)	4 (40%)	0	3 (30%)
5	16	6 (37%)	7 (44%)	0	3 (18%)
6	8	2 (25%)	5 (63%)	1 (12%)	0
7	25	7 (23%)	9 (36%)	1 (4%)	8 (32%)

Table 2. Student by their degree of learning on the dimensions of didactic Ideational Knowledge*

Dimension	Sub-dimension	Degree of learning		
		Low	Moderate	High**
Ideational richness	Mean number of ideas (of all lengths) per concept	1	2	4
	Mean number of multi-concept links	1	1	1
	Mean number of concepts per link	0	3	3
	Range of link multiplicity	1	1	1
	Mean number of didactic ideas (of all lengths) per link	1	1	4
	Mean number of basic ideas (propositions) per idea	0	1	4
Complexity	Mean number of basic ideas (propositions) per idea	4	1	0
Abstractness	Number of cluster titles	2	2	0
	Number of clusters	2	0	2
	Existence of map rationale	4	0	0
Generality	Distance from the taught class	0	1	1
Importance of concepts	Number of links of the important concepts (teacher and school student) with other concepts	0	2	3
Meaning of important concepts	Number of aspects in the meaning of the important concepts (teacher and school student)	0	1	4
Depth	Number of clusters and sub-clusters	2	2	0
Integration	Proportion of cluster's internal links out of all map's links	0	0	0

* Dimensions' values, and their degree of learning were determined individually for each student.
** The number of students in each degree of learning.

4. Discussion

The first finding is that most students acquired substantial portions of the new ideas whose sources were not the supervisory conference, which included only small numbers of didactic ideas. However, some ideas that are expressed by the relations among the concepts in some of the new ideas (which were not learned in other settings) ensued from the formation by some students of the larger units of concept clusters and titles for these clusters: A newly created cluster and title express at least two abstract and more complex ideas out of the smaller components of concepts and links. That formation is probably facilitated or prompted by the very mapping, especially the

possibility to simultaneously spatially display graphically of the inter-concept relations, may have cued or prompted that formation.

The second finding is that most students' didactical ideational knowledge expanded as well as the self creation of substantial aspects of these ideas, namely, complexity, abstractness, and generality. These findings may be due to three factors: the availability to the student of an explicit graphic representation of their knowledge, and to the nature of ideas dealt with in the conference, the student's degree of attentiveness to, capability and willingness to learn the ideas, and the nature of the acquaintance of the supervisor and the student.

Most issues discussed in the conference related to the events in the taught class, in particular to the contents rather the didactical ideas. This focus may be correlated to the large numbers of the two important concepts of teacher and pupil to the concept content, parallel to reports by Holloway & Wampold (1983) and Zimpher, deVoss, & Nott (1980), who noted lack of wide theoretical contexts.

In the conferences most students felt at ease and were willing to listen and learn and were allowed to raise their concerns, all of which can be attributed to the free atmosphere and the supervisor's openness and acceptance. However the students may have been restrained to certain extents by the supervisor's dual guiding and evaluative role. The ability of the supervisor to form close informal relations with her student and create atmosphere in which the student can both accept criticism and learn from it was recognized by Odell (1990) as an important factor in the success of teacher education.

5. Conclusions and Recommendations

We can draw certain direct conclusions from the study and its findings that are pertinent to the use of Ideational Knowledge Mapping in supervisory conference and additional purposes and settings.

Ideational Knowledge Mapping is appropriate to represent diverse aspects of students' and supervisors' ideational knowledge, which depends to large extent on their willingness to expose it. There is much room and opportunities to employ Ideational Knowledge Mapping as it enables the identification of sources and self created students' ideational knowledge, which is difficult, maybe impossible to attain by traditional probes.

Supervisory conferences are short, mostly oral, are critical and hence emotionally stressful, and yet they proved quite effective and valuable in conveying didactic ideas. Improving their settings can increase their facilitation in learning didactic knowledge. It is possible to design and base the supervisory conference on the student's didactical ideational knowledge expressed in her pre-conference map, and to discuss particular issues that were represented in it.

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